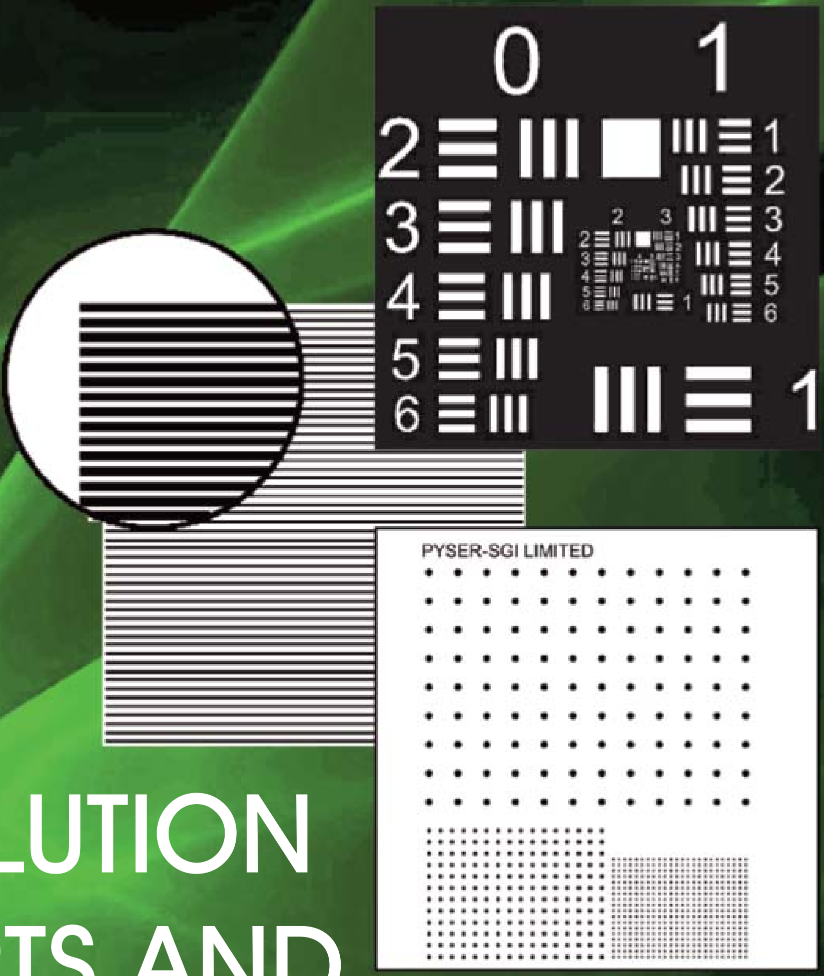
PYSER – SGI



RESOLUTION CHARTS AND GRATINGS

Optical Resolution Charts, Ronchi Rulings and Grids

The optical resolution charts are used to test characteristics such as resolution, contrast, distortion and modulation transfer function (MTF) of lenses, cameras and optical systems.

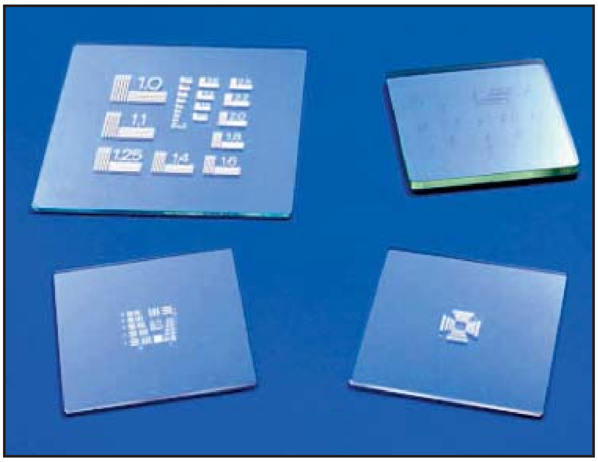
Ronchi rulings and grids are used to create interference patterns, to measure distortion and for MTF measurements.

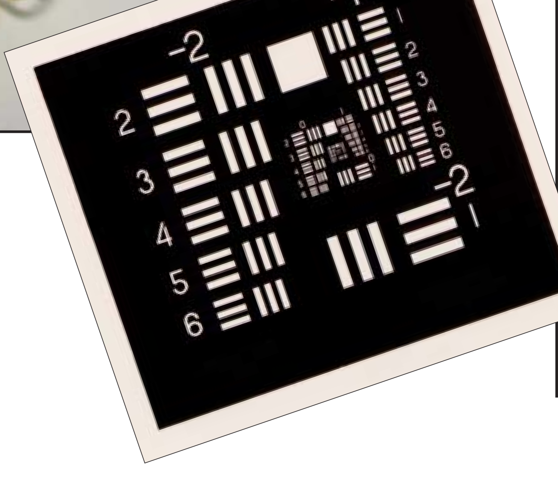
Pyser-SGI manufactures a range of charts on glass and in metal foil. Customers often require special charts for specific applications and these can be made to your exact requirements.

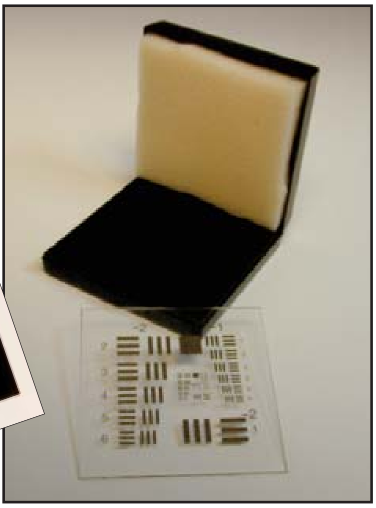
In addition to these products, we also supply a specialist NPL/HSE test slide for checking the resolving power of phase contrast microscopes – see part ref S84 in stage micrometers catalogue.

Special products are available for testing windscreens to various International standards. These are included here.

All products in this catalogue are available on other materials to special order. If the product you require is not listed, then please contact us with your requirements.



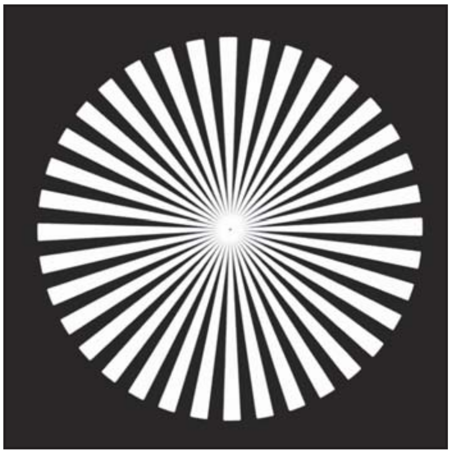




Star Test Target

Also known as Siemens star or sunburst pattern. It is used qualitatively to demonstrate focussing effects, optical astigmatism and for rapid assessment of focal plane.

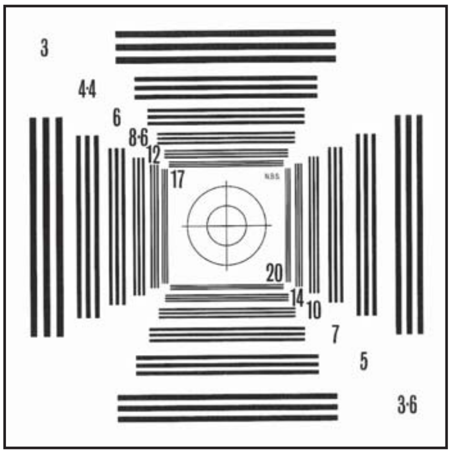
Pattern	R65	R66
Sector pitch	10º	5º
Number of sectors	36	72
Outside diameter of image	25mm	25mm
Unresolved centre core	0.2mm	0.4mm
Normal substrate	B270 Glass	B270 Glass
Overall size	50mm x 50mm	50mm x 50mm
Image type	Vacuum deposited chrome	Vacuum deposited chrome
Order code	06B01091	06B01092



NBS 25 Resolution Test Chart

A series of gratings diminishing in size as they go towards the central target. Lines range from 3 lines per mm to 20 lines per mm. Supplied as a positive high contrast chrome image on glass substrate 50mm x 50mm. Also available in low contrast and negative form.

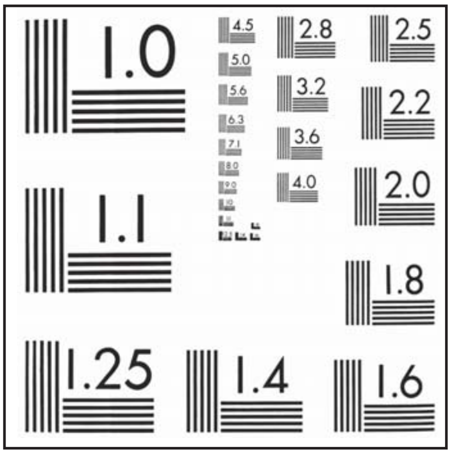
Pattern	Description	Order Code
R60	NBS 25 Test Chart, 3-20 lines per mm chrome surface image on B270 glass 50mm x 50mm	06B01090



NBS 5 Bar Test Chart (BS4657)

This consists of elements of 5 bars ranging from 1 line per mm to 18 lines per mm, with adjacent numbers indicating the number of lines per mm. Produced as a vacuum deposited chrome image on 75mm x 75mm glass.

Pattern	Description	Order Code
R67	NBS 5 Bar Test Chart, 1-18 lines per mm, chrome surface image on B270 glass 75mm x 75mm	06A01093

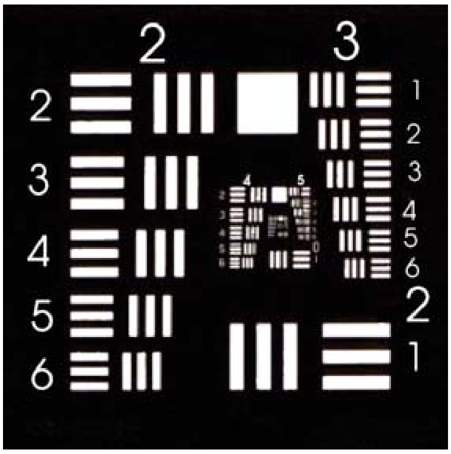


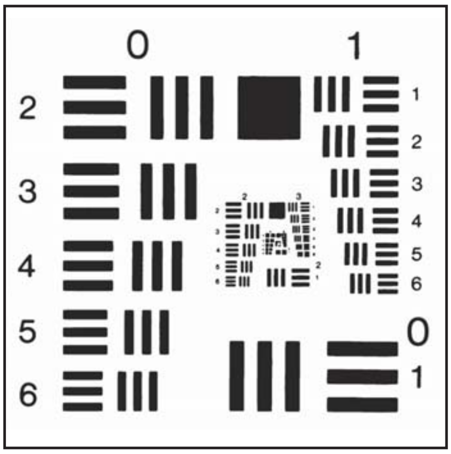
USAF 1951 Test Charts

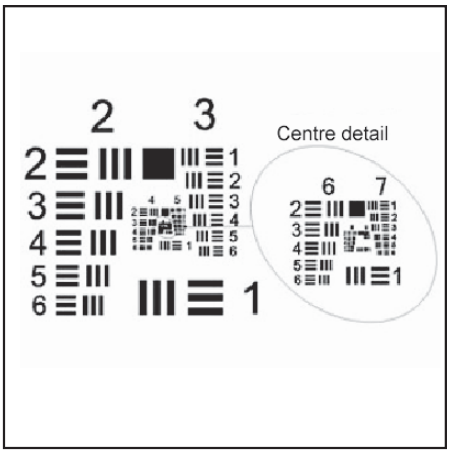
USAF resolution charts are recognised the world over as a universal standard for testing the vertical and horizontal resolution of imaging systems. Each element on the chart comprises three vertical bars and three horizontal bars, and the detail on these slides is as fine as 0.78microns (644 line-pairs per mm). The resolution of the imaging system is normally specified as the Group and Element of the finest bars that can be clearly defined - See further information on back page of brochure.

The six standard versions manufactured by Pyser are as follows:

Pattern	Groups/Elements	Image	Size/ Glass Type	Order Code
R70	0/1 to 7/6	Positive	50mm x 50mm x 1.5mm, B270	06B01096
R71	-2/1 to 7/6	Positive	75mm x 75mm x 1.5mm, B270	06B01097
R75P	0/1 to 9/3	Positive	50mm x 50mm x 1.5mm, Soda Lime	06B01102
R75N	0/1 to 9/3	Negative	50mm x 50mm x 1.5mm, Soda Lime	06B01103
PS75P	0/1 to 9/3	Positive	76mm x 25mm stainless steel slide mount with Soda Lime image insert, serial numbered, supplied in wooden case	05B01090
PS75N	0/1 to 9/3	Negative	76mm x 25mm stainless steel slide mount with Soda Lime image insert, serial numbered, supplied in wooden case	05B01091
Special Versions	White glass versions, multiple targets, selected groups/elements and foil versions are also available.			







We are also able to make custom versions of the USAF Test Chart which are often required for special applications, and can supply them with Internationally traceable certificates of calibration.

USAF Resolution Chart, Number of Lines per mm

Element Number	*Group Number*											
	-2	-1	0	1	2	3	4	5	6	7	8	9
1	0.250	0.500	1.00	2.00	4.00	8.00	16.00	32.00	64.0	128	256	512
2	0.280	0.561	1.12	2.24	4.49	8.89	17.95	36.00	71.8	144	288	576
3	0.315	0.630	1.26	2.52	5.04	10.1	20.16	40.30	80.6	161	322	644
4	0.353	0.707	1.41	2.83	5.66	11.3	22.62	45.30	90.5	181	362	
5	0.397	0.793	1.59	3.17	6.35	12.7	25.39	50.80	102.0	203	406	
6	0.445	0.891	1.78	3.56	7.13	14.3	28.51	57.00	114.0	228	456	

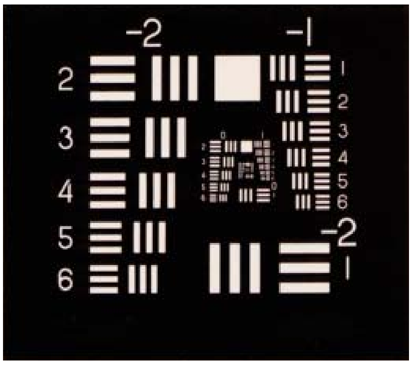
USAF Resolution Chart, Width of Bars in mm

Element Number	*Group Number*											
	-2	-1	0	1	2	3	4	5	6	7	8	9
1	2.00	1.00	0.500	0.250	0.125	0.063	0.031	0.016	0.0078	0.0039	0.0020	0.00098
2	1.79	0.89	0.446	0.223	0.111	0.056	0.028	0.014	0.0070	0.0035	0.0017	0.00087
3	1.59	0.79	0.396	0.198	0.099	0.050	0.025	0.012	0.0062	0.0031	0.0016	0.00078
4	1.42	0.71	0.355	0.177	0.088	0.044	0.022	0.011	0.0055	0.0028	0.0014	
5	1.26	0.63	0.315	0.158	0.079	0.039	0.020	0.0098	0.0049	0.0025	0.0012	
6	1.12	0.56	0.281	0.140	0.070	0.035	0.018	0.0088	0.0044	0.0022	0.0011	

Thermal Imaging

This is a metal foil version of the USAF test chart giving clear, negative type, high contrast patterns in groups -2 to 4. The absence of a glass support substrate removes the problems of masking infra red regions. Foil is double plated to increase rigidity.

Pattern	Description	Order Code
R74	Thermal Imaging test chart. Group -2, element 1 to Group 4, element 6. Copper foil size 100mm x 100mm, blackened one side	06A01101

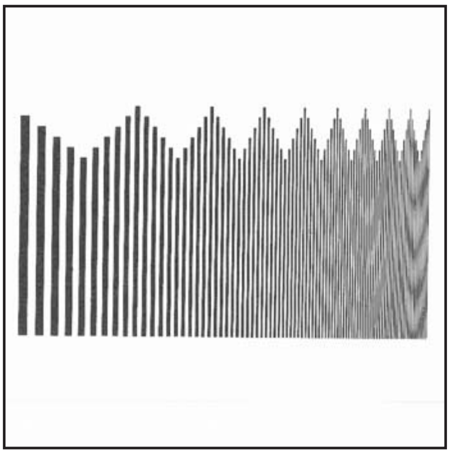


R72 Sayce Logarithmic Test Chart

The chart is ruled with 90 lines and spaces of gradually decreasing width. The width of lines and spaces are in logarithmic series, and their lengths are varied to assist counting. The charts have a base length of 100mm and are supplied on 0.175mm thick film.

Typically in use, the image is examined to determine the finest detail that can be distinguished. The finest resolved line is then counted to define the resolution of the device. Includes 6 charts, resolution table and instructions for use.

Pattern	Description	Order Code
R72	Sayce Test Chart photographic image on ester based film, 130mm x 85mm, 0.175mm thick	06A01100



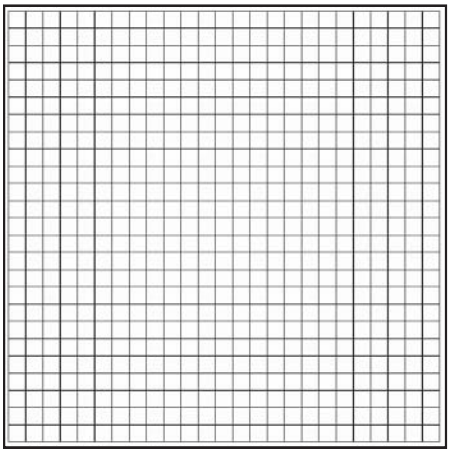
4 Bar - MTF Targets

Pyser-SGI manufacture targets on glass and in metal foils to your exact designs for modulation transfer function testing.

Grids - Square Nets

Vacuum deposited chrome on glass grid patterns in a variety of pitches. All supplied on 50mm x 50mm B270 glass, 1.5mm thick, ruled over the entire surface.

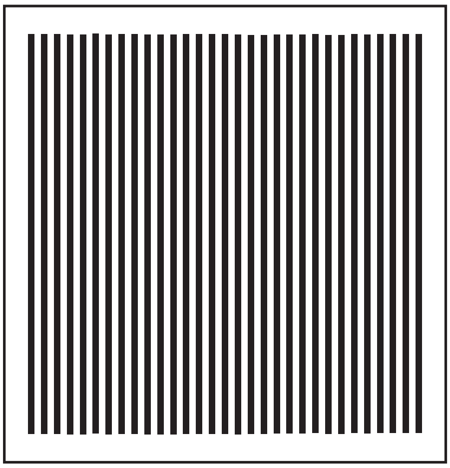
Pattern	Description	Order Code
R1	Grid with line pitch of 2mm	21B01250
R2	Grid with line pitch of 1mm	21B01251
R3	Grid with line pitch of 0.5mm	21B01252
R4	Grid with line pitch of 0.25mm	21B01253
R10	Grid with line pitch of 0.1mm	21B01254

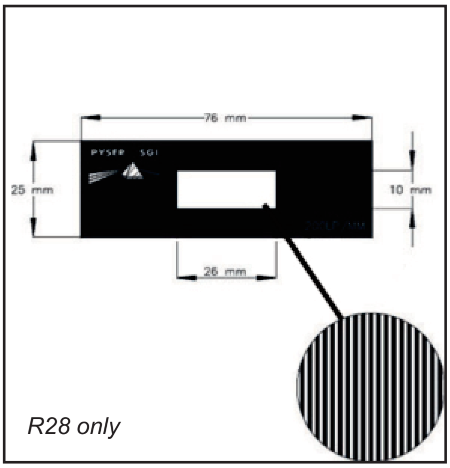


Gratings - Ronchi Rulings

Vacuum deposited chrome gratings on glass substrate. Typically used for testing of resolution, field distortion and parfocal stability, but may be paired to provide interference patterns (fringe patterns) and as light gates.

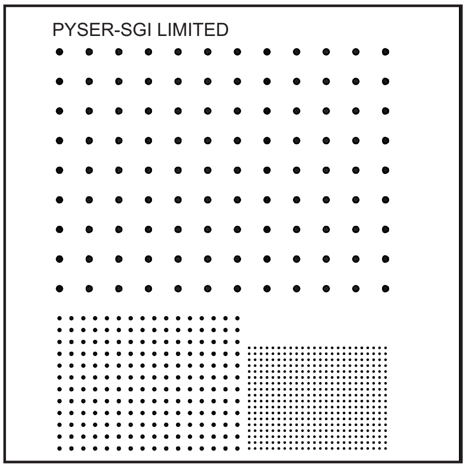
Pattern	Line Pairs per mm	Image Size	Size/ Glass Type	Order Code
R12	2	50mm x 50mm	50mm x 50mm x 1.5mm, B270	21B01270
R15	8	50mm x 50mm	50mm x 50mm x 1.5mm, B270	21B01271
R16	20	50mm x 50mm	50mm x 50mm x 1.5mm, B270	21B01272
R17	40	50mm x 50mm	50mm x 50mm x 1.5mm, B270	21B01273
R25	50	50mm x 30mm	50mm x 50mm x 1.5mm, B270	21B01290
R26	100	50mm x 30mm	50mm x 50mm x 1.5mm, B270	21B01291
R27	125	50mm x 30mm	50mm x 50mm x 1.5mm, B270	21B01292
R28	200	26mm x 10mm	76mm x 25mm anodised aluminium slide mount with Soda Lime image insert	21B01293
Special Versions	White glass versions, multiple targets, selected groups/elements and foil versions are also available.			





R28 only

Grid Dot Arrays



- 3 image areas all on one plate
- Different dot size and pitch in each area
- Ideal for different magnifications to test field flatness, distortion and size

Sizes:	12 x 9 array of 1mm dots at 5mm pitch
	16 x 12 array of 0.5mm dots at 2mm pitch
	24 x 18 array of 0.2mm dots at 1mm pitch

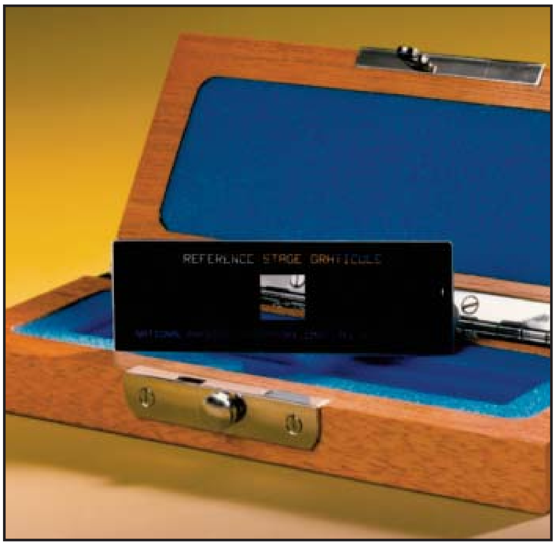
Pattern	Description	Size	Order Code
R76	Grid dot array, 3 image areas, as detailed above	101mm x 101mm x 2.2mm, green float glass, high reflective chrome image	06B01104
Available with certificate of calibration.			

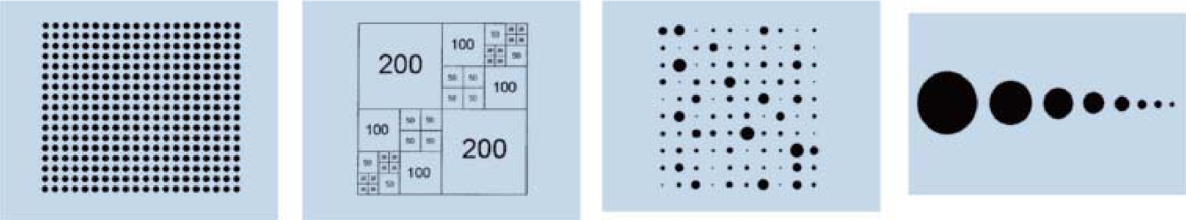
The grid dot array can be made on other substrates, other chrome finishes and white glass to special order.

Image Analysis Standard (Reference Stage Graticule)

This calibration stage contains four test areas comprising; a 400 x 400 micron square grid, a 20 x 17 monosize array of 15 micron diameter spots, a Root-2 array of spots from 3 to 48 micron diameter, and a log normally distributed array of 100 spots ranging from 4.5 to 27 micron diameter. It is ideally suited for calibrating image analyser systems and can also be used as a high precision micrometer.

Pattern	Description	Order Code
RSG	Reference stage graticule 75mm x 25mm slide	**05B01085**





Test Images for Analysis of Automotive Glass to BSI, DIN & ECE Standards - Windscreen Test Slides

Pyser-SGI now offer a comprehensive range of image distortion test slides for the Automotive Glass industry.

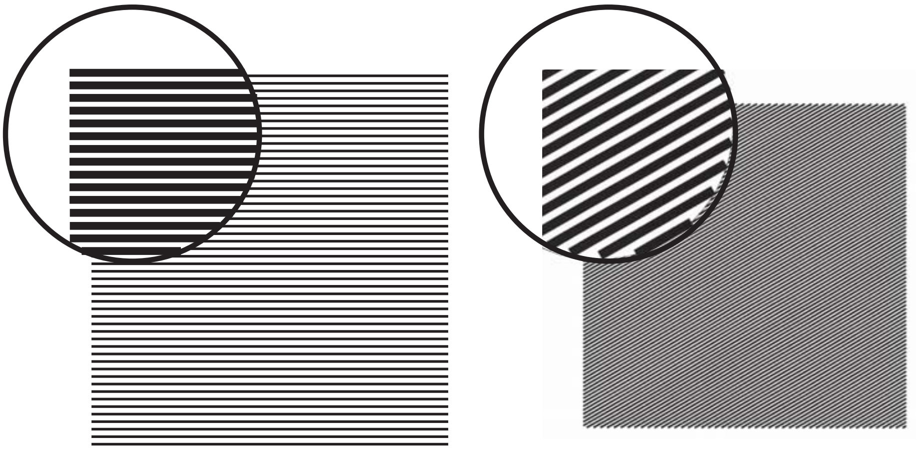
The testing of vehicle windscreens has been tightened-up in recent times with the introduction of BS, DIN & ECE standards. These standards specify optical testing methods for parameters such as angular deviation, refractive power and optical distortion. Compliance to these standards is essential for windscreen manufacturers.

All of the optical test methods utilise specialised patterned glass to give projected images, which are then analysed. The slides themselves are manufactured by Pyser-SGI on standard 50mm x 50mm B270 glass.

All standard slides are designed for use on projectors with a focal length of 90mm and a projector distance of 8 metres.

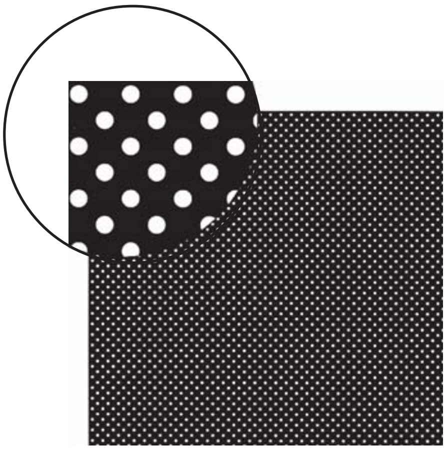
Grid Lines

Slides with inclined lines are used in both BS 857 & DIN 52305 standards for testing angular deviation. Horizontal lines are used to test for refractive power.



Dot Patterns

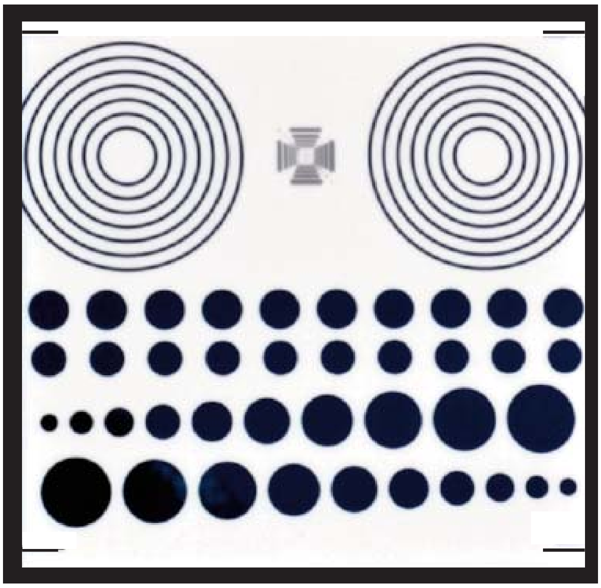
The test for optical distortion detailed in ECE Regulation 43 calls for a matrix of clear dots on an opaque background to simulate oncoming headlights. These can be produced to accomodate various focal lengths



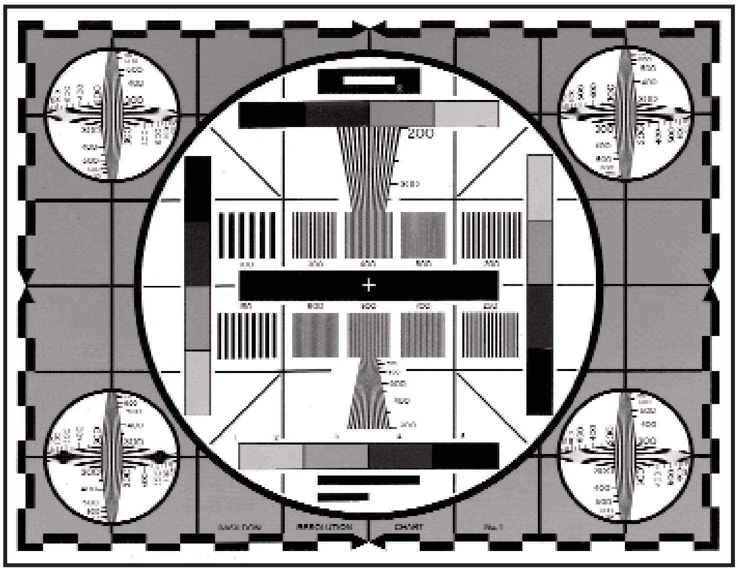
Description	Order Code
Dot matrix slide for testing to ECE Regulation 43	06B01200
Horizontal 12mm lines for testing to DIN 52305	06B01201
30° 12mm lines	06B01202
45° 12mm lines for testing to DIN 52305	06B01203
30° 1.5mm lines for testing to BS857:1967	06B01204
30° 2.5mm lines for testing to DIN 52305	06B01205

Custom Resolution Charts

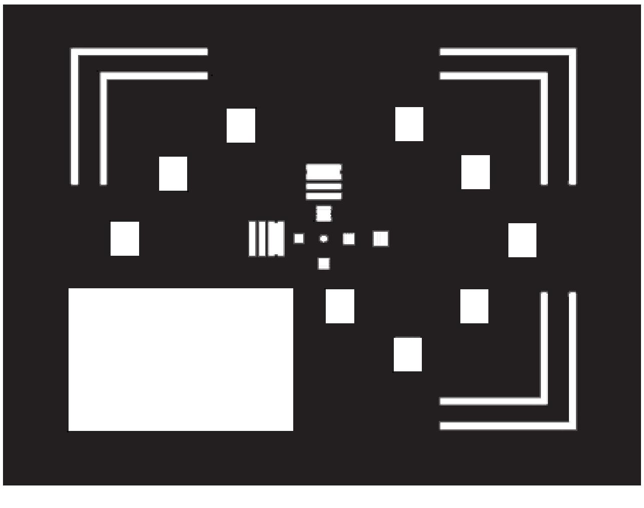
For numerous applications a standard test chart may not meet the needs. Pyser-SGI produce custom versions to your exact needs on most types of glass, in metal foil and on film. Shown here are a few examples.



Blue chrome on white glass
High contrast for imaging systems



Bright chromeon fused silica glass
Resolution gratings
Gray scales



Double plated metal foil
Copper/Nickel
Electroformed
Blackened one side

Other products

Definitions

Resolution: The ability of an optical device to clearly define a particular size or feature. Most commonly a grating is used to measure the resolution in line pairs per mm.

Distortion: The alteration of the optical image caused by imperfections or faults in the optical components. A percentage measurement is normally used.

Depth of Field. The distance between the front and back of an image that appears to be in focus. Optics will focus on one focal plane, but the depth of the image that is in focus will be greater to the naked eye. In general lower magnification devices have a larger depth of field than higher magnification devices.

Contrast: The measurement of the ability of an optical device to clearly separate the light and dark areas of an image. Normally expressed in terms of percentage.

Modulation Transfer Function (MTF): The resolution and performance of an optical system can be characterised by a quantity known as the modulation transfer function (MTF). This is a measurement of the optical systems ability to transfer contrast from the image to the sensor at a specific resolution. A Ronchi ruling or 4 Bar test chart is often used as the image object.

Ronch Ruling or Ronchi Grating: A series of lines and spaces of equal width used for resolution, distortion and contrast testing. Named after the Italian Physicist Vasco Ronchi, who invented the Ronchi test for telescopes.

Use of USAF Test Charts and similar test patterns

The USAF Test Chart comprises a series of blocks of bars and spaces arranged in groups and elements. As the group and element number increases, the width of the bars/spaces decreases. Each element block is made up of 3 horizontal gratings and 3 vertical gratings. Used for determining the resolution of optical devices.

The resolution of an optic or system is defined as the group and element where the difference between the black and white image of the grating can still be clearly determined. The resolution can be expressed as vertical or horizontal resolution due to the pattern arrangement on the USAF Test Chart.

The table below shows the line pairs per mm on the USAF Test Chart. As an example group 9 element 3 has 644 lines per mm which equates to a bar width of 0.78µ.

USAF Resolution Chart, Number of Lines per mm

Element Number	***Group Number***											
	-2	-1	0	1	2	3	4	5	6	7	8	9
1	0.250	0.500	1.00	2.00	4.00	8.00	16.00	32.00	64.0	128	256	512
2	0.280	0.561	1.12	2.24	4.49	8.89	17.95	36.00	71.8	144	288	576
3	0.315	0.630	1.26	2.52	5.04	10.1	20.16	40.30	80.6	161	322	644
4	0.353	0.707	1.41	2.83	5.66	11.3	22.62	45.30	90.5	181	362	
5	0.397	0.793	1.59	3.17	6.35	12.7	25.39	50.80	102.0	203	406	
6	0.445	0.891	1.78	3.56	7.13	14.3	28.51	57.00	114.0	228	456	

Dealer Stamp

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